Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

fasciatus Bosc., will bite man under experimental conditions, while the squirrel fleas, *Hoplopsyllus anomalus* and *Ceratophyllus acutus,* feed readily on man's blood.[10] The same authors have also shown[11] that fleas from rodents will adapt themselves to a host of a different species and that fleas from squirrels will attack rats even in the presence of their normal host. Plague bacilli have been demonstrated in both the common squirrel flea, *Ceratophyllus acutus,* and also in the lice (probably *Hæmatopinus montanus*) very commonly found on the same host.[12] Experimental work has also been done to determine the susceptibility to bubonic plague of other rodents in which the disease has not yet been reported under natural conditions.[13] Finally in experimental cases[14] rat fleas have conveyed plague from rats to ground squirrels and squirrel fleas from squirrel to squirrel, and also to guinea pigs and rats. H. B. WARD.

DESERT PLANTS[1]

In the opinion of the reviewer, this book constitutes the most noteworthy contribution thus far submitted from the Desert Botanical Laboratory. In a measure it may be said to be the outcome of previous contributions and others not hitherto published. Investigations in progress there during the several years since the establishment of the desert laboratory, while they have a wider range of application, have centered in the effort to describe and interpret the interplay of stimulus and response as between desert environment and plants in the desert. It in no way detracts from the merit of Professor Spalding's contribution to say that the results of these investigations constitute a prominent feature of the book, and indeed it stimulates increased appreciation of his work to observe that he assumed the difficult task of so correlating the results of a staff of specialist investigators as to bring about a reasonable measure of interpretation of the rôle of environmental stimuli in shaping the origin, distribution, associations and movements of desert plants. The book lays claim to being only a partial interpretation of the problems of desert vegetation and expressly points out the need of continued investigation not merely of the area under consideration (the so-called "Desert Laboratory domain"), but of comparative studies of more areas widely distributed through the desert.

---

[10] McCoy and Mitzmain, "Public Health Reports," Vol. 24, No. 8.

[11] "Public Health Reports," Vol. 24, p. 1013.

[12] Geo. W. McCoy, "Public Health Reports," Vol. 24, p. 475.

[13] Geo. W. McCoy, *Jour Infectious Diseases,* Vol. 6, p. 283.

[14] Public Health Reports, Vol. 25, p. 465 and 659.

[1] "Distribution and Movements of Desert Plants," by Volney M. Spalding, Carnegie Institution of Washington, publication No. 113, October, 1909, pp. 144, with 30 plates.

Having set itself the task of interpreting the ways of plants in the desert, the management of the desert laboratory began by investigating intensively a small area of typical desert country. The laboratory site appears to have been selected with a view to having at its door this ideal field of investigation, which is an area of not over a mile in radius.

Professor Spalding rightly supposes that no other small area anywhere has had centered upon it the intensive study of so many well-equipped investigators as has this typical bit of desert, and he might have added that perhaps in no other case has there been a more adequate equipment of apparatus and instruments for work of a precise nature and, in the reviewer's opinion, no other instance where more adequate methods have been devised for pursuing the investigations.

The work of collaborating specialists is largely presented as distinct sections or chapters of the book.

The geology of the vicinity of the Tumamoc Hills is presented with particular reference to its relation to the distribution and movements of plants by Professor C. F. Tolman, of the University of Arizona (pp. 67–82), in the chapter on Environmental and Historical Factors. In this chapter also Dr. B. E. Livingston contributes a section (pp. 83–93) on the soils of the desert laboratory domain. Reference is made here likewise to the evaporation studies conducted by Dr. Livingston. It is of course beyond the range of the present reviewer's task to take up Dr. Livingston's work in detail, but it seems an appropriate place in which to point out a striking case in which endowed research has yielded results of far-reaching application in behalf of economic development, namely, in the relation of soils and evaporation to plant production generally.

Dr. W. A. Cannon, of the Desert Laboratory staff, contributes a thoroughgoing study of the root system of the giant cactus (*Cereus giganteus*), together with a comparison of the root systems of certain other marked desert species (pp. 59–66). Such specific studies furnish the source of reliable data for conclusions as to the relation which the habits and structure of plants bear to their distribution.

Floristic investigations have been undertaken by Professor J. J. Thornbur, botanist of the Arizona Experiment Station, and reported in an effective manner under the title Vegetation Groups of the Desert Laboratory Domain (Chap. IV, pp. 103–112). In this contribution, floristic studies, instead of being dry lists of species, are made to contribute materially to the chief questions as to the origin, association and movements of the vegetation.

In the chapter devoted to defining plant associations and habitats, pages 24 to 27 embrace an account of the lichens of the Laboratory domain, by Professor Bruce Fink, of Miami University.

Distributional maps with accompanying notes were prepared by Mr. J. C. Blumer, of the laboratory staff. In the reviewer's opinion maps of this sort, showing, as they do, location and individual frequence of notable species, are of essential help to the reader, as they must have been indispensable to the writer of the book.

Finally, among the collaborative contributions is a chapter (V, pp. 113–119) on the Origin of Desert Floras, by Dr. D. T. MacDougal, director of the Desert Laboratory and of the Division of Botanical Research of the Carnegie Institution of Washington.

In this study of the vegetation of the Desert Laboratory domain Professor Spalding has led the attack from the plant side, seeking to define the actual conditions of distribution, association and movements in the vegetation as a whole and specifically in the case of prominent desert species, and always with a view to relating facts of distribution, structure, etc., with the environmental conditions under which they have been worked out.

Accordingly, a considerable portion of the book is of a descriptive nature. Chapter I presents the plant associations and habitats of the laboratory domain. The author distinguishes some twelve associations exclusive of parasitic and symbiotic plants and miscellaneous introduced species, meaning by ''association'' an aspect or phase of vegetation, such, for example, as the cottonwoods and willows of a river bank, a mesquite forest, or chaparral made up chiefly of palo verde and catclaw or, on the other hand, of Mexican greasewood. These associations reflect topographic and soil conditions of the area. Remembering the traditional view as to the hostility of the desert toward plants, one is rather surprised to learn that this inhospitable domain harbors between four and five hundred species which are by no means all xerophytes, but species adjusted to the most diverse moisture requirements. To be sure, this is due in a measure to the inclusion of a river and its flood plain in the Laboratory domain. Still, a surprising number of species manage to exist on the arid situations without being marked by any special xerophytic structures.

Chapter II takes up in detail an analysis of the distribution of certain of the most prominent desert species. As to the factors determining the local distribution and association of species, these are, just as everywhere else, chiefly topographic and soil conditions. Manifestly it is primarily the water supply as affected by conditions of soil and topography which is the critical factor, but soil drainage or aeration is found to play a large rôle and, indeed, is the determining factor in the distribution of certain species.

Special attention may be called to that portion of Chapter II which presents the facts and conclusions as to aspect preference as exhibited on the laboratory domain. The question, in brief, is to account for the differences in the vegetation covering of slopes having a general southerly exposure as compared with those having a general northerly one. Here is found fully justified the claim advanced by certain American plant ecologists, that only by exact quantitative study of the items involved may one expect to arrive at an explanation of distribution, association and movements of plants. In this connection the study of the root system of *Cereus giganteus* sustains its status as a model piece of ecological investigation.

Another thing which we learn from this chapter (II) is that while, as we supposed, the chief struggle of plants in the desert is against the physical environment, there is still a right marked element of competition amongst desert species with its consequent features of accommodation (commensalism?) or of extermination and succession. Since, however, the problems of distribution, association and movements are so little complicated by the factor of crowding as compared with mesophytic forest societies, for example, it has seemed to the reviewer that the desert furnishes about the simplest as well as the most inviting point of attack for the ecologist.

In chapter VI under Review and Discussion and in Chapter VII, a summary, Professor Spalding brings forward in condensed form a survey of the work of investigation done on the laboratory domain and particularly the tentative or positive conclusions he is able to formulate as a result of these investigations. So far as regards the local distribution and association of species, the reviewer is unable to discern that the general view thus far held as to the rôle of the so-called edaphic factors is in any wise modified, but our knowledge of the manner in which this rôle is played has been materially enriched by the work of Professor Spalding and his collaborators.

Foregoing the temptation to comment on many other interesting details of this book, there remains yet to consider the crowning question as to whence came the desert vegetation and how did it come to be what it is? Upon this point Professor Spalding's conclusions are quite positive, as indicated in the following words from his book:

> The general continuity of geological history since the Tertiary indicates a relatively long period within which plants of the Laboratory domain have one by one or at any rate by no mass movements, become established in their places. There is reason to believe that throughout this period the processes now going on before our eyes have been in progress. The present flora, therefore, may be assumed to be merely the final stage so far of just such a series of events as are now observable. . . . The small area within its limits (the Laboratory domain) has received representatives of genera that have shared in the great migrations south and north along the Cordilleras, but through the time that has elapsed since the greater movements it has also received by entirely ordinary means the plants that have come and are still coming to it.

We are unable to gather from these words whether Professor Spalding means that "the processes going on before our eyes" relates simply to movements of vegetation or includes also modifications whereby ecological types—as, for example, the giant cactus—arise. In this connection, Dr. MacDougal's chapter on the origin of desert floras is illuminating. His view is in agreement with Professor Spalding's as to the fact that there is little evidence of extensive migrations of the characteristic xerophytes of this desert from which it is to be inferred that these investigators believe the Sonoran desert to have been and to be now a center of origins for its flora. MacDougal brings us face to face with the question as to *how the desert makes its flora* if one may give the question this popular cast. He rejects the idea of so-called adaptive changes representing ontogenetic and morphogenetic responses (made by a plant when exposed to desert conditions, for example) as being not necessarily adaptive and in any event not capable of being transmitted to offspring. He believes, however, that what has been observed to take place under experimental conditions might take place when plants or generations of plants are subjected to the stimulus of desert environment. His words are:

> The influence of external conditions upon the germ plasm, however, has been seen to produce irreversible changes in a hereditary line by which new combinations of qualities and new characters were called out, which were fully transmissible. Furthermore the newly produced forms perished in some localities endured by the parental type, but exceeded it in weathering the conditions of other localities.

In the treatment of the larger aspects of the question of the origin and movements of desert plants the intensive study of a single small area fails to furnish a large enough fund of comparative data to make a wholly satisfactory basis for conclusions. The reviewer would modestly suggest that the Sonoran desert (meaning the desert areas of our southwest and of northern Mexico) is a very large and diverse region in which not merely individual species but whole genetic groups have become xerophilized (with apologies for spurious coinage), and that correlated investigations at numerous points and a study of genetic relationships in connection with distribution, association, movements and modification (meaning transmissible qualities or characters) would furnish a broader basis for the interpretation of the ways of plants in the desert at large.

In a final word the reviewer would invite attention to the status of Professor Spalding's book considered in relation to plant ecology. In full appreciation of other recent ecological contributions of similar merit the opinion is advanced that this book stands in a special way as an index of the new era in geographic ecology in which a field of botanical research which was prone to abound in verbosity and in the discovery of "adaptations" has been brought to the status of a more exact science employing quantitative methods of study. It is not boastful to say that this newer phase of plant ecology represents especially the outcome of the teaching and investigations of a small group of American botanists (of which group the present reviewer can not claim to be a member) who have sought to put the study of plant relations upon the same basis as that pursued in the study of plant physiology in the limited sense.

WILLIAM L. BRAY.